Wind tunnel AER stats

Sasha D. Hafner

02 August, 2022

Get wind tunnel data only.

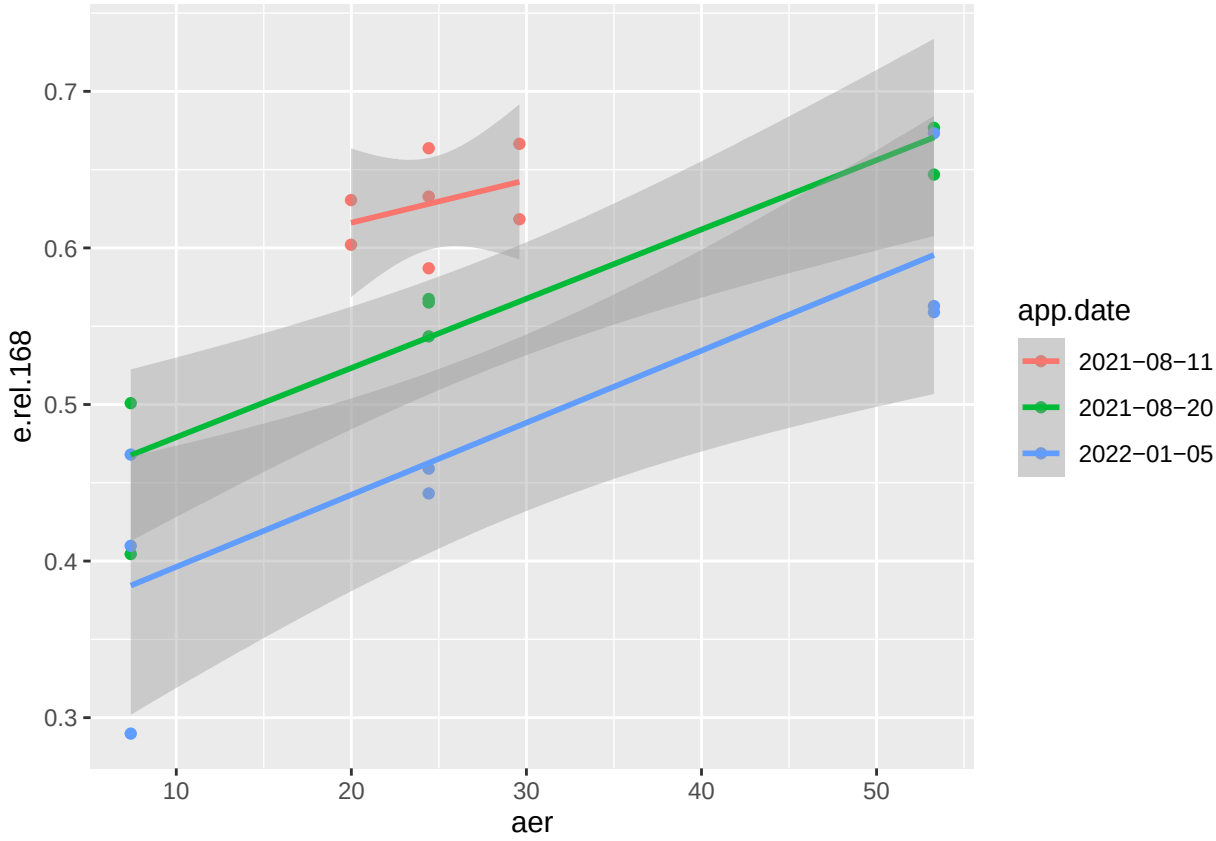
```
wsumm <- subset(isumm, meas.tech == 'Wind tunnel')
dfsumm(as.data.frame(wsumm))
```

```
##
##  22 rows and 22 columns
##  22 unique rows
##                       app.date    pmid   meas.tech meas.tech2     aer
## Class                character integer   character  character numeric
## Minimum            2021-08-11    1904 Wind tunnel         wt     7.4
## Maximum            2022-01-05    1925 Wind tunnel         wt    53.3
## Mean                     <NA>    <NA>        <NA>       <NA>    27.2
## Unique (excld. NA)          3      22           1          1       5
## Missing values              0       0           0          0       0
## Sorted                   TRUE    TRUE        TRUE       TRUE   FALSE
##
##                         aer.grp     cta air.temp.mean air.temp.min
## Class                    factor numeric       numeric      numeric
## Minimum              Low 7 or 20     181          2.46         -3.4
## Maximum            High 30 or 54     211          15.4         11.4
## Mean                  Medium 25      193          10.5         4.93
## Unique (excld. NA)             3       3            19            6
## Missing values                 0       0             0            0
## Sorted                     FALSE   FALSE         FALSE        FALSE
##
##                    air.temp.max wind.2m.mean wind.2m.min wind.2m.max rain.cum
## Class                   numeric      numeric     numeric     numeric  numeric
## Minimum                     8.5          0.1         0.1         0.1        0
## Maximum                    22.3         0.72        0.72        0.72        0
## Mean                       17.1        0.367       0.367       0.367        0
## Unique (excld. NA)            6            5           5           5        1
## Missing values                0            0           0           0        0
## Sorted                    FALSE        FALSE       FALSE       FALSE     TRUE
##
##                    rain.cum.48 j.NH3.mean j.NH3.min j.NH3.max e.cum.final
## Class                  numeric    numeric   numeric   numeric     numeric
## Minimum                      0     0.0928         0     0.524        19.6
## Maximum                      0      0.264    0.0375      4.31        47.7
## Mean                         0      0.198   0.00741      2.67        37.8
## Unique (excld. NA)           1         22        12        22          22
## Missing values               0          0         0         0           0
## Sorted                    TRUE      FALSE     FALSE     FALSE       FALSE
```

```
##
##                     e.rel.final e.cum.168 e.rel.168
## Class                   numeric   numeric   numeric
## Minimum                   0.317      17.9      0.29
## Maximum                   0.711      47.4     0.677
## Mean                      0.568      36.9     0.553
## Unique (excld. NA)           22        22        22
## Missing values                0         0         0
## Sorted                    FALSE     FALSE     FALSE
##
```

```
ggplot(wsumm, aes(aer, e.rel.168, colour = app.date)) +
  geom_point() + geom_smooth(method = lm)
```

```
## `geom_smooth()` using formula 'y ~ x'
```




```
m1 <- lm(e.rel.168 ~ aer + factor(app.date), data = wsumm)
summary(m1)
```

```
##
## Call:
## lm(formula = e.rel.168 ~ aer + factor(app.date), data = wsumm)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.096728 -0.029017  0.002533  0.023081  0.081478
##
## Coefficients:
```

```
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 0.5178449  0.0228701  22.643 1.12e-14 ***
## aer                         0.0045001  0.0006139   7.330 8.32e-07 ***
## factor(app.date)2021-08-20 -0.0851197  0.0243427  -3.497  0.00258 **
## factor(app.date)2022-01-05 -0.1646130  0.0236372  -6.964 1.66e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0454 on 18 degrees of freedom
## Multiple R-squared:  0.8367, Adjusted R-squared:  0.8095
## F-statistic: 30.75 on 3 and 18 DF,  p-value: 2.685e-07
```

```
anova(m1)
```

```
## Analysis of Variance Table
##
## Response: e.rel.168
##                  Df   Sum Sq  Mean Sq F value    Pr(>F)
## aer               1 0.090085 0.090085  43.716 3.300e-06 ***
## factor(app.date)  2 0.099990 0.049995  24.261 7.776e-06 ***
## Residuals        18 0.037093 0.002061
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
confint(m1)
```

```
##                                 2.5 %       97.5 %
## (Intercept)                 0.469796669  0.565893222
## aer                         0.003210302  0.005789826
## factor(app.date)2021-08-20 -0.136261741 -0.033977684
## factor(app.date)2022-01-05 -0.214272793 -0.114953172
```

```
drop1(m1, test = 'F')
```

```
## Single term deletions
##
## Model:
## e.rel.168 ~ aer + factor(app.date)
##                  Df Sum of Sq      RSS     AIC F value    Pr(>F)
## <none>                        0.037093 -132.48
## aer               1   0.11073 0.147820 -104.06  53.733 8.318e-07 ***
## factor(app.date)  2   0.09999 0.137082 -107.72  24.261 7.776e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
m2 <- lm(e.rel.168 ~ aer * factor(app.date), data = wsumm)
summary(m2)
```

```
##
## Call:
## lm(formula = e.rel.168 ~ aer * factor(app.date), data = wsumm)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.094525 -0.023834  0.002643  0.024457  0.083681
##
## Coefficients:
```

```
##                                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      0.561722   0.123891   4.534 0.000339 ***
## aer                              0.002719   0.004976   0.546 0.592332
## factor(app.date)2021-08-20      -0.126888   0.128441  -0.988 0.337903
## factor(app.date)2022-01-05      -0.211453   0.127405  -1.660 0.116446
## aer:factor(app.date)2021-08-20  0.001705   0.005081   0.336 0.741498
## aer:factor(app.date)2022-01-05  0.001884   0.005047   0.373 0.713838
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04793 on 16 degrees of freedom
## Multiple R-squared:  0.8382, Adjusted R-squared:  0.7877
## F-statistic: 16.58 on 5 and 16 DF,  p-value: 7.863e-06
```

```
anova(m2)
```

```
## Analysis of Variance Table
##
## Response: e.rel.168
##                       Df   Sum Sq  Mean Sq F value    Pr(>F)
## aer                    1 0.090085 0.090085 39.2186 1.133e-05 ***
## factor(app.date)       2 0.099990 0.049995 21.7652 2.723e-05 ***
## aer:factor(app.date)   2 0.000341 0.000170  0.0742    0.9288
## Residuals             16 0.036752 0.002297
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
confint(m2)
```

```
##                                      2.5 %     97.5 %
## (Intercept)                      0.299085792 0.82435851
## aer                             -0.007829345 0.01326677
## factor(app.date)2021-08-20      -0.399171131 0.14539516
## factor(app.date)2022-01-05      -0.481538886 0.05863375
## aer:factor(app.date)2021-08-20 -0.009066198 0.01247719
## aer:factor(app.date)2022-01-05 -0.008815410 0.01258340
```

```
drop1(m2, test = 'F')
```

```
## Single term deletions
##
## Model:
## e.rel.168 ~ aer * factor(app.date)
##                       Df  Sum of Sq      RSS     AIC F value Pr(>F)
## <none>                               0.036752 -128.68
## aer:factor(app.date)   2 0.00034069 0.037093 -132.48  0.0742 0.9288
```